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ON THE

METEOROLOGY OF THE ALBION MINES,

NOVA SCOTIA.

BY
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THE Albion Mines are situated in the county of Pictou and province of Nova Scotia in North America, lat. $45^{\circ} 34' 30''$ north, and long. $62^{\circ} 42'$ west from Greenwich. They are upon the western side of the East river, which flows in a northerly direction from its source in the St. Mary's mountains until it empties itself into the bay or harbour of Pictou, which is one of the most eastern harbours of the continent of North America, and opening into the Gulf of St. Lawrence.

The sea is distant about ten miles, with some rising land intervening, but probably not more than 250 feet high. The ground rises moderately on all sides around the mines, except in the direction of the river, which at this point spreads into two branches, and forms an interval of rich soil of about half a mile in breadth. The surface of the surrounding country is very undulating, being intersected by brooks or small streams (often dry in summer) running in every direction.

The soil in the immediate vicinity of the mines is of a loamy clay, forming a thin crust upon the aluminous shales lying below, and which dip in a north-easterly direction at a general angle of 19° ; several thick seams of coal lie below and alternating with the shales; while the limestone formation underlying the coal measures crops about one mile to the south-west of the mines, and gives its characteristic formation of conical hills to the surface of the country. Fines and spruce have been the prevailing forest trees upon the uplands, with birch and maples intermixed on some parts; while large hemlocks have marked the lines of the brooks, and a few elms have grown upon the interval between the forks of the river; and as hardly any of the clearances extend one mile back from the banks of the river, the country may be considered as almost in its primeval forest state as regards the climate of the country.

The latitude being $45^{\circ} 34' 30''$ north, we enjoy the sun's influence in the shortest days for eight hours and forty minutes, and in the longest days during fifteen hours and twenty minutes.

The mean temperature of the earth at this latitude is theoretically calculated at 58° , but from the mean daily observations for ten years taken twice a-day, or the two extremes of night by a self-registering thermometer, and by actual observation at noon, it is found to be 41° ·94 at the mines, or 16° colder than theoretically estimated, owing chiefly to its position on the east side of the continent, and to the cooling influence of the sea breezes during the summer months.

The mean temperature of the year is found to vary in different years to the extent of 3° , but the observations have not been extended through a sufficient number of years to know whether the fluctuations are periodical or not.

159° have been observed under the full influence of the sun's rays, and 40° below zero were observed at the bottom of the coal pit (250 feet deep) when the thermometer on the surface registered 22° .

The greatest heat that has been observed in the shade 6 feet above the ground was 98° , and the greatest cold 22° below zero, giving an extreme range of 120° .

By dividing the year into two parts at the mean temperature of 42° , there are 190 days of warm and 175 days of cold weather; the mean temperature crossing that line on an average of ten years on the 1st day of May and 6th day of November.

If we divide the year into four seasons, and assume winter to continue whilst the daily mean is below 32° , spring and autumn to last while the daily mean is 10° below and above the annual mean, or from 32° to 52° , and call it summer whilst the daily mean is above 52° , we shall then have the average length of the seasons as follows:—

Spring 32° to 52° from 27th March to 31st May	66 days.
Summer all above 52° from 1st June to 24th Sept.	116 "
Autumn 32° to 52° from 25th Sept. to 26th Nov.	63 "
Winter all below 32° from 27th Nov. to 26th March....	120 "

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The mean temperature has varied during ten years only $3\frac{1}{2}^{\circ}$ of Fahr., a quantity certainly very inconsiderable when we compare by sensation the warmth of one hour of the day with another, yet capable, when added or subtracted from the whole year, of producing a decided difference in the seasons. We must not, however, too hastily connect with a low mean the idea of a cold winter, or that of a hot summer with a high one. The heat is added or taken away sometimes in one season or quarter of a year, sometimes in another; and again occasionally almost throughout the year, as will be more distinctly seen by an examination of the table of mean temperature†; or it may be caused by the difference between the mean temperatures of day and night, which I consider an important deviation, and deserving of further inquiry, as it affects vegetation.

The registry of the weather at these mines was originally commenced at the request of Admiral Owen, and accordingly published in the Pictou papers, so that he might compare our weather, and more particularly the course of the wind, with the register kept by the surveying party on board H.M. steamer 'Columbia' in the Bay of Fundy; it was afterwards forwarded to the Smithsonian Institute at Washington to be incorporated along with the numerous registers kept in other parts of the continent of North America; and having now been kept for a decade of years, it is hoped that the following tables and summary of some facts deduced therefrom may be of interest to the friends of meteorology.

It is proper here to acknowledge that Howard's 'Climate of London' has suggested the plan of the greatest part of the work; and a desire to compare the climatic phenomena on the east side of North America with those recorded by him on the opposite side of the Atlantic or on the west coast of Europe, has been the chief inducement for doing so.

It is to be regretted that the instruments used have not been compared with standard ones; and therefore no corrections have been attempted to be made excepting the correction of the barometrical readings for temperature by the tables of the Royal Society of London. This barometer, with thermometer attached, is

* By Brewster's formula, $81\cdot5 \cos \text{Lat.}$

† These Tables are not published in the present Report.

hung in a sitting-room at 120 feet above the level of the sea; it is graduated from a fixed point, and the mercury is enclosed in a kid cup.

Two thermometers, self-registering for night, are hung 6 feet from the ground on the side of the house exposed to a N.E. direction, but protected from the N.W. winds by a clump of trees at a few yards distance; another registering thermometer is placed upon the ground and exposed to the full action of the atmosphere, and the difference in its readings at night from the other thermometers placed on the house was shown in a Table.

The rain is measured by a 12-inch diameter funnel-shaped tin pipe, where 1 inch of the funnel reads as 9 inches of the float-rod; the snow is received into a pail of 3 feet depth and 8 inches in diameter, suspended by a double ring like a ship's compass, so that no snow-drift falls into it, and the melted snow is measured in the rain-gauge.

The force of the wind has been measured during 1852, to a certain extent, by a machine having a board of 1 foot (made to face the direct action of the wind) pressing against a spring which marked the force in pounds of pressure. The clearness of the sky, velocity of clouds, and also the direction of the different currents, are from observations made with the naked eye at different times in the day. Other atmospheric phenomena have been recorded where it was thought that they might assist in elucidating changes or modifications in the climate.

Our winter begins by the temperature on the 27th November, and continues 120 days, or nearly one-third of the whole year. The mean temperature of the season is $20^{\circ}857$ for the months of December, January, and February, but for the whole 120 days the mean temperature is $22^{\circ}015$. The hottest day during the ten years was the 11th January 1843, when the thermometer did not fall below 42° at night and rose to 63° in the day, or a mean of $52^{\circ}5$. The coldest day was the 19th January 1849, when the thermometer at night marked -15° and did not rise above -8° all day, or a mean of $-11^{\circ}5$; greatest cold -22° on 7th January 1851.

The mean height of the barometer is 29.6903 ins., being .0497 in. below that of autumn. The range of the column is greatest in this season; the highest, $30^{\circ}757$ ins., being on 28th February 1849, and the lowest, $28^{\circ}410$ ins., on 31st December 1848. The mean range is $2^{\circ}125$ ins.

The winds prevail from south to west and west to north during December, while northerly winds prevail in January and February. Upon the mornings of greatest cold, or when below zero, the wind generally blows from the S.S.W. The average rain, including melted snow, is 11.5282 ins., of which nearly 5 ins. fall in December. It only hailed four times during the ten recorded winters, whilst there is scarcely a January passes but there is lightning or thunder once.

When the frost sets in it generally continues steady for a length of time. The longest frost without a break was from 3rd December 1848 to 22nd March 1849, or 108 nights; with the exception of a rain storm on the 12th February, there was frost from 24th November 1851 until the 21st April 1852, or 142 days. The shortest frost was only 32 days in succession in the winter of 1844-45. During the continuance of these frosts the ground is generally covered with snow, so that the vegetation and roots of the grasses do not suffer, and good roads are made upon it which enable the farmer and lumberer to carry their produce easily to market. Fogs are rarely seen; the atmosphere is generally dry and bracing, and there are but few days on which workmen are unable to work out of doors; people expect it to be cold, and are accordingly clad in woollens; and it is remarked that the more steady and colder the winter is, the more healthy are the inhabitants.

Occasionally a silver thaw will encase the trees, &c., sometimes nearly to the thickness of an inch, and then the fruit trees are apt to have their branches broken by the weight; but it is a magnificent sight to see the forest or even a single tree bending in graceful curves beneath its crystal load, and reflecting the rays of the sun from every point with all the prismatic hues of the rainbow. The sun was not visible from the 15th to the 31st December 1843.

Spring commences on the 27th March according to the temperature; its duration is only sixty-six days, during which the medium temperature is elevated from 32° to 52° . The mean of the normal season is $37^{\circ}44$, but for the sixty-six days it is $43^{\circ}12$; the sun effecting by his approach an advance of $11^{\circ}105$ upon the mean

temperature of the winter. The temperature increases very regularly about 10° each month from February to June, contrary to the sudden starts to which it is subject in Britain. The easterly winds prevail in April and May, which keeps the weather cold, and sometimes a foot of snow falls; but in general there are fewer days of rain, and less falls in April than in any other month.

One half of the nights are frosty; the mean temperature at night in April being $27^{\circ}637$, while May is as low as $37^{\circ}63$; this greatly retards vegetation, although the sun has great power; the average heat in the daytime in April being $46^{\circ}24$, and in May $59^{\circ}287$. In 1844, on the 1st April, the thermometer marked 3° below, and on the 2nd 2° below zero; this very unusual degree of cold was followed by a fortnight of calm fine weather with northerly winds, and very little snow or rain falling.

The mean height of the barometer for the normal spring is $29^{\circ}7067$ ins., being $\cdot 0164$ inch above the winter. The extreme elevations and depressions of the column go off in great measure during the season, and by the end of spring the range is contracted to about $1\frac{1}{2}$ inch. Mean range of the season $1^{\circ}665$ inch.

The wind is easterly for one-third of the time, which is in a great measure owing to the large bodies of floating ice off in the Gulf of St. Lawrence; so that although the westerly winds blow generally during the nights and early in the mornings, yet it is almost sure to shift round towards the N.E. as soon as the sun raises the temperature, or about ten o'clock in the morning.

The average rain is $9^{\circ}9439$ ins.; the showers are generally heavy and not of long continuance, while the evaporation is excessive; so that in a few hours afterwards the land is in good order for the farmer to proceed in sowing his crops.

Summer begins on the 1st of June and lasts for 116 days according to the temperature, with a mean temperature of $6^{\circ}187$, the whole 117 days being above 52° ; the sun effecting by his position in the northern hemisphere an advance of $18^{\circ}75$ upon the mean temperature of the spring. The temperature of the normal summer is $63^{\circ}36$. The medium of the twenty-four hours rises during the season from 52° to $73^{\circ}5$, and returns again by the close to the former level on the 24th September. The mean temperature of July and August do not differ from each other more than the tenth of a degree, while for four years out of the ten there was a slight frost on one morning in the month of July as well as August, while upon an average there are four frosty nights in June and five in September, so that frequently there is frost in every month of the year.

The mean height of the barometer for the normal summer is $29^{\circ}7180$ ins., or $\cdot 0113$ inch above the vernal mean.

The mean range is $1^{\circ}07$ in. In England the least range is in the month of July, while here it exceeds the mean range of both June and August by nearly one-tenth of an inch; the least range being $1^{\circ}063$ in. in June. The predominating winds in this season are from south to west; but still one-third of the time the wind blows during the day from north to east or from east to south; but this cannot be more than a local breeze, for the upper currents, as shown by the course of the clouds, mark in general a S.W. current.

The mean rain is $9^{\circ}6049$ ins., less falling in June than in any other month of the year.

Autumn begins on the 25th of September, and lasts only sixty-three days, or until the mean temperature falls again below 39° . The mean temperature of the season is $46^{\circ}243$, being $17^{\circ}12$ below the three months of summer, but the mean temperature of the sixty-three days is $43^{\circ}04$.

The mean height of the barometer for the normal autumn is $29^{\circ}740$ ins., being the highest average throughout the year, and the extreme range $2^{\circ}102$ ins.

The winds blow for two-thirds of this season from south to west and west to north.

The average quantity of rain is $13^{\circ}5264$ ins., October being our wettest month as regards quantity; but as the showers are heavy and not of long continuance, there is a good deal of fine pleasant weather at this season of the year, particularly about the end of October or beginning of November, when there are ten days or a fortnight of clear sunny days with the temperature rather above the mean, and which short period is usually called the Indian summer.

The dews are frequently very heavy at this season, so much so that the quantity precipitated in one night in the rain-gauge has often measured the one or two thousandth part of an inch.

The mean height of the barometer, as deduced from the observations taken during a period of ten years, is 29·71377 ins. at an altitude of 120 feet above the level of the sea.

In a general Table* were exhibited the greatest and least elevations of the barometer in each month for the ten years 1843 to 1852. To the maximum heights of each year was annexed the mark X and to the minimum 0. Of the yearly maxima, the greatest number, or one-half, occur in the first two months, and the rest at the end of the year, with one exception in April. Six of the yearly minima occur in the last two months of the year; the other four minima occur in the beginning of the year. Thus there are five months (May to September) in which the barometer visits neither extreme of its yearly variation, while the higher and lower annual extremes are chiefly the product of what constitutes the winter at this station.

Another Table*, drawn from the results of the preceding one, serves for more easy reference. The average of the third column, or the medium between the average elevations and depressions, is seven hundredths of an inch below the mean height for the climate (29·71377 ins.), the reason of which is that the depressions occupy a smaller space of time than the elevations; in consequence, a less proportion of them comes into an average founded on daily results.

The average annual range is 1·944 in.; the range varies in different years about six-tenths of an inch.

The greatest elevation in ten years appears to have been 30·757 ins. "corrected" on the 27th February 1849; the day was introduced by a moderate N.N.E. breeze, a rimy frost and fog in the morning; the temperature was 1° below zero during the preceding night, it stood at 35° at noon; the day was very fine, with a few cirrus clouds from the west. The next highest was 30·753 ins. "corrected" on the 2nd April 1844, when the wind had also prevailed for three days from the N.E., but was gentle from the south at the time of the extreme range. The temperature had been unusually low, 3° below zero on the night preceding the 1st, and 2° below zero on the 2nd; the temperature was only 23° at noon on the 1st, and 32° at noon on the 2nd. Fog at sunrise on the 1st; cirrus clouds from S.W. on both days, and on the 2nd halo round both the sun and moon.

The greatest depression in ten years occurred on 3rd November 1851, when the barometer descended to 28·505 ins. at 12 P.M.; there was fog in the evening, with lightning and thunder at 10 P.M.; the wind was a fresh breeze from the S.W.; the temperature was 54° out of doors at 9 P.M. Howard's observation in England, that neither extreme is produced very suddenly, is not borne out here; it has often been known to rise or fall about an inch within twenty-four hours, and the two extremes have occurred within a few days of each other; while in February and March 1849 the barometer never fell below 30 ins. for seventeen days in succession.

Rain.—The mean annual depth of rain is 44·9676 ins. for ten years; the greatest quantity, 58·805 ins., being in 1848, and the least quantity, 32·921 ins., being in the year following, or 1849.

Contrary to the observed connexion in England between a wet and cold season, and a warm and dry one, no such affinity appears to connect them at this station; for the greatest quantity of rain fell in 1848, when the mean temperature was 43°·2, or 1°·3 above the mean†, while the driest year was 1849, when the mean temperature was 41°·1, or '8 below the mean.

The greatest quantity that fell in any one month was 10·58 ins. in October 1843, and the least quantity '913 in. in May 1849.

Upon an average the greatest quantity falls in the month of October, confirming the correctness of the observations of the Indians, who say that the frost never sets in until the brooks are full. The least quantity of rain falls in the month of June.

Upon an average it rains on 171 days in each year, and twice as often in the day-time as during the night.

* These Tables are not published in the present Report.

† Seven inches above the average falling in the first quarter, when the mean temperature was 4° above the average.

In August 1848 it rained 6·328 ins. in four days, and 1850, September 8th, it rained 3·955 ins. in twenty-four hours; the storm in both instances blowing from N.W. to N. and N.E.

With regard to the proportions of rain in the former and latter half of the year, they stood thus by the average:—

For the first six months, January to June, 18·7465 ins.; for the latter six months, July to December, 25·8568 ins. The sums of the mean temperature of these two portions thus divided are 208·97 ins. and 294·70, being nearly one-third higher in the latter half of the year.

If we divide the circle in another place we shall have a very different result.

From the fourth to the ninth month (April to September) the average rain amounts to 18·1572 ins., from the tenth to the third month (October to March) 26·4461 ins. Now the sum of the mean temperatures of the first six months in this series, or the summer half-year, is 331·51, and that of the remaining six months, or winter half-year, 172·16. Here the relative quantities of rain remain about the same, while the temperatures are reversed.

In Howard's 'Climate of London,' the driest month in the year is March 1, February 2, April 3, May 4, June 5, September 6, January 7, August 8, December 9, October 10, July 11, November 12; while at the Albion Mines June is 1, April 2, May 3, September 4, July 5, February 6, January 7, March 8, August 9, November 10, December 11, October 12.

JANUARY.—The sun in the middle of this month continues about 9 hours and 6 minutes above the horizon. The temperature rises in the day, on an average of ten years, to 25°·46, and falls in the night to 12°·18; the difference, 13°·28, representing the mean effect of the sun's rays for the month, may be termed the solar variation of the temperature.

The mean temperature of the month is 18°·84; but this mean has a range of 13°·1 in ten years, which may be termed the lunar variation of the temperature. The warmest year was 1843, when the winds prevailed from the S.W.; and the coldest was 1851, when the winds prevailed from the N.W. and N.E.

The barometer in this month rises on an average of ten years to 30·3515 ins., and falls to 28·9012 ins.; the mean range is therefore 1·4503 in.; but the extreme range in ten years is 2·012 ins. The mean height for the month is 29·6958 ins.

The prevailing winds are the class from west to north; the average of ten years being north to east 3·8, east to south 4·4, south to west 7·4, west to north 15·4.

The mean rain or melted snow at 3 feet from the earth is 3·3814 ins.; and the number of days upon which it falls averages 5 nights and 11 days, or a total of 16.

The snow falls upon an average of 13 days, and a mean depth of 1 ft. 10 ins. The heaviest storm was in 1844, when it snowed 2 ft. 9 ins. on a level in three days. In the first part of the winter the snow is very dry, and it takes 17 ins. of snow melted to make 1 in. of water.

Upon an average, 29 nights have constantly the temperature below the freezing-points, while 6·7 nights and 1 day fall below the zero-point. The mean degrees of frost average 623; the greatest number, 825, being in 1851, and the least, 447, in 1843.

FEBRUARY.—Length of day in the middle of the month about 10 hours 18 minutes. Mean of greatest heat by day 28°·075, of greatest cold by night 10°·95; difference, or solar variation, 17°·125.

Mean temperature of the month 19°·51; difference in the mean or lunar variation 13°·3. The warmest years were 1848 and 1850, when the winds prevailed from the N.W.; and the coldest year was 1849, when the wind prevailed from the north to east.

The barometer ranges on a mean from 30·365 ins. to 28·905 ins.—difference 1·460 ins.; but the full range in ten years extends to 2·174 ins. Mean height for the month is 29·6866 ins.

The prevailing winds are the class from west to north; the average of ten years being north to east 4·2, east to south 4·9, south to west 6·9, west to north 12·3.

The mean rain or melted snow is 3·2673 ins., falling on an average on 4 nights and 9 days, or a total of 13 through the month.

The snow falls on 11 days upon an average, and a mean depth of 2 ft. 1 in. The heaviest storm was in 1849, when it snowed 2 ft. 6 ins. in two days.

There are 27 nights of frost upon an average, while 7·7 nights go below zero; and in three years there was one day on which the temperature kept below zero all day. The mean degrees of frost average 600; the greatest number, 870, in 1849, and the least, 433, being in 1850.

MARCH.—Length of day in this month averages 11 hours 42 minutes. Mean of greatest heat by day $36^{\circ}135$, of greatest cold by night $17^{\circ}85$; difference, or solar variation, $18^{\circ}285$.

Mean temperature of the month $26^{\circ}98$; difference in the mean or lunar variation $8^{\circ}7$. The warmest year was 1846, and the coldest year was 1847, when the winds prevailed from the west to north.

The barometer ranges on a mean from $30\cdot282$ ins. to $28\cdot916$ ins.—difference $1\cdot366$ ins.; but the full range in ten years extends to $1\cdot776$ in. Mean height for the month is $29\cdot672$ ins.

The prevailing winds are the class from west to north; the average of ten years being north to east $5\cdot5$, east to south $5\cdot5$, south to west 7, west to north $13\cdot0$.

The mean rain or melted snow is $4\cdot3963$ ins., falling on an average on 4 nights and 10 days, or a total of 14 through the month.

The snow falls on 11 days upon an average, and a mean depth of 2 ft. $1\frac{1}{2}$ in. The heaviest storm was in 1850, when it snowed 16 ins. in three days. There are 28 nights of frost upon an average, while 2·8 nights go below zero. The mean degrees of frost average 453; the greatest number, 557, in 1849, and the least, 338, being in 1846.

APRIL.—Length of day in the middle of the month 13 hours 22 minutes. Mean of greatest heat by day $46^{\circ}24$, of greatest cold by night $27^{\circ}63$; difference, or solar variation, $18^{\circ}61$.

Mean temperature of the month $36^{\circ}88$; difference in the mean or lunar variation $5^{\circ}6$. The warmest year was 1843, and the coldest 1850; in the former the wind prevailed from the south to west, and in the latter from north to east.

The barometer ranges on a mean from $30\cdot2763$ to $29\cdot0243$ ins.—difference $1\cdot2515$; but the full range extends to $1\cdot871$ in ten years. Mean height for the month is $29\cdot7022$ ins.

The prevailing winds are the class from west to north; the average of ten years being north to east $7\cdot7$, east to south $3\cdot5$, south to west $7\cdot4$, west to north $11\cdot4$.

The mean rain or melted snow is $2\cdot650$ ins., falling on an average on 4 nights and 8 days, or a total of 12 days through the month.

The snow falls on 7 days upon an average, and a mean depth of $9\frac{1}{2}$ ins. The heaviest storm was in 1852, when it snowed $12\frac{1}{2}$ ins. in two days.

There are 24 nights' frost upon an average, and in 1844 two nights went below zero. The mean degrees of frost are 165; the greatest number, 257, in 1850, and the least, 92, being in 1846.

MAY.—The length of the middle day is about 14 hours 38 minutes. The temperature rises by day to $59^{\circ}28$, and falls by night to $37^{\circ}63$; the solar variation is consequently $21^{\circ}65$.

Mean temperature of the month $48^{\circ}44$ —difference in the mean or lunar variation $9^{\circ}4$. The warmest year was 1846, when the winds prevailed from the south to west; and the coldest year was 1849, when the winds prevailed from north to east.

The barometer ranges on an average from $30\cdot1507$ to $29\cdot2190$ ins.; the mean range is therefore $\cdot9317$, but the full range in ten years is $1\cdot347$. Mean height for the month $29\cdot7459$ ins.

The prevailing winds are the class from west to north; the average of ten years being north to east $7\cdot6$, east to south $6\cdot4$, south to west $7\cdot9$, west to north $9\cdot1$.

The mean rain or melted snow is $2\cdot8976$ ins., falling on an average on 4 nights and 9 days, or a total of 13 through the month. The snow falls on 2 days on an average, and a mean depth of 1 inch. The heaviest storm was in 1844, when it snowed 4 ins. in one day. There are ten nights of frost upon an average, giving 31 mean degrees of frost. The greatest number, 58, were in 1843, and the least number, 8, were in 1848.

Hail fell once in this month in 1850, and once in 1852.

JUNE.—Length of day in the middle of the month is 15 hours 20 minutes. Mean of greatest heat by day $69^{\circ}99$, of greatest cold by night $46^{\circ}63$; difference, or solar variation, $23^{\circ}36$.

Mean temperature of the month $58^{\circ}29$; difference in the mean lunar variation $7^{\circ}4$. The warmest year was 1847, when the wind prevailed from the east to south; and the coldest year was 1851, when the wind prevailed from north to east.

The barometer ranges on a mean from 30.0871 to 29.2600 ins.—difference .8271; but the full range extends to 1.063 in ten years. Mean height for the month is 29.5739 ins.

The prevailing winds are the class from south to west; the average of ten years being north to east $7^{\circ}5$, east to south $5^{\circ}4$, south to west $9^{\circ}4$, west to north $7^{\circ}7$.

The mean rain is 2.1539 ins., falling on an average on 4.5 nights and 9.4 days, or a total of 14 days through the month.

No snow falls in this month, and there are upon an average 3.8 nights of frost, but only occasionally, causing the thermometer on the house to fall below 32° , and giving a mean of $2^{\circ}15$ of frost.

Hail fell once in this month in 1844, and once in 1848.

JULY.—Length of the middle day about 15 hours. Mean highest temperature by day $77^{\circ}80$, mean lowest by night $54^{\circ}92$. Solar variation $22^{\circ}88$.

Mean temperature of the month $65^{\circ}94$; difference in the mean lunar variation $6^{\circ}8$. The warmest year was 1849, when the wind prevailed from the south to west; and the coldest year 1851, when the wind prevailed from south to west.

The barometer ranges on a mean from 30.0662 to 29.3094 ins.—difference .7568; but the full range extends to 1.162 in ten years. Mean height for the month 29.7104 ins.

The prevailing winds are the class south to west; the average of ten years being north to east $5^{\circ}9$, east to south $5^{\circ}2$, south to west 14, west to north $5^{\circ}9$.

The mean rain is 3.0210 ins., falling on an average of 5 nights and 9.6 days, or a total of 15 days through the month.

No snow falls in this month, and on an average there are .5 nights of frost, but not causing the thermometer on the house to fall below 32° .

Hail fell once in this month in 1844.

AUGUST.—Length of the middle day about 13 hours 50 minutes. Mean highest temperature by day $76^{\circ}34$, mean lowest by night $55^{\circ}39$. Solar influence $20^{\circ}95$.

Mean temperature of the month $65^{\circ}85$; difference in the mean lunar variation $5^{\circ}1$. The hottest year was 1843, when the wind prevailed from the S.W.; and the coldest year 1850, when the wind prevailed from north to east and south to east for half the month.

The barometer ranges on a mean from 30.1206 to 29.3872 ins.—difference .7334; but the full range extends to 1.096 in ten years. Mean height for the month is 29.7699 ins.

The prevailing winds are the class from south to west; the average of ten years being north to east 6, east to south $6^{\circ}4$, south to west $10^{\circ}6$, west to north 8.

The mean rain for this month is 4.4299 ins., falling on an average on 4.9 nights and 9.2 days, or a total of 14 days through the month. In 1848 it rained 6.328 ins. in four successive days.

No snow falls in this month, and on an average there are 0.5 nights of frost, but not causing the thermometer on the house to fall below 32° .

Hail fell once in this month in 1843, and again in 1851.

SEPTEMBER.—The length of the middle day is about 12 hours 20 minutes. The heat on a mean rises to $65^{\circ}64$ and falls to $46^{\circ}59$, making a solar variation of $19^{\circ}05$.

Mean temperature of the month $56^{\circ}09$; difference in the mean lunar variation $7^{\circ}3$. The hottest year was 1846, when the wind prevailed from south to west 17 days; and the coldest year was 1843, when the wind prevailed from west to north for 13 days.

The mean temperature of nights in this month correspond very nearly to those of the month of June, but the days average $4^{\circ}5$ colder.

The barometer ranges on a mean from 30.1617 to 29.1381 ins.—difference 1.0236; but the full range extends to 1.530 in ten years. Mean height for the month is 29.7671 ins.

The prevailing winds are from south to north; the average of ten years being north to east $5^{\circ}4$, east to south $4^{\circ}9$, south to west 10, west to north $9^{\circ}7$.

The mean rain for this month is 3.0048 ins., falling on an average on 3.8 nights and 8.6 days, or a total of 12.4 throughout the month. On the 8th September 1850,

it rained 3·955 ins. in 24 hours, causing a great freshet in the rivers, which did much damage by carrying away several bridges.

A little snow fell once in this month in 1851, and on an average there are five nights of frost, giving 3°·9 mean of frost.

Hail fell once in this month in 1846, 1851, and 1852.

OCTOBER.—The middle day in this month has the sun for 10 hours 48 minutes. The mean of greatest heat by day is 53°·882, and of greatest cold by night 38°·526; the solar variation 15°·356.

Mean temperature for the month 46°·34; difference in the mean lunar variation 4°·4. The hottest year was 1851, when the wind prevailed from south to west 15 days; and the coldest year was 1847, when the wind prevailed from the north to west 11 days, and south to west 12 days.

The barometer ranges on a mean from 30·3173 ins. to 29·0121 ins.,—difference 1·3052 in.; but the full range extends to 1·924 in. in ten years. Mean height for the month 29·7657 ins.

The prevailing winds are from south to north; the average of ten years being north to east 5·3, east to south 5·7, south to west 10·2, west to north 9·8 days.

The mean rain for this month is 5·7760 ins., falling on an average on 5·8 nights and 9·7 days, or a total of 15·5 throughout the month. In 1843 it rained 10·53 ins. on 20 days during this month.

Sometimes as much as 3 ins. of snow fall during two or three days in this month, but it does not remain long on the ground. On an average there are 10·4 nights of frost, giving 35°·3 of frost.

Hail fell once in this month in 1844, 1846, 1848, 1849, 1851 and 1852.

NOVEMBER.—The length of the middle day is 9 hours 26 minutes, or half an hour longer than in London. The average temperature rises to 42°·25, and falls to 30°·35, making a solar variation of 11°·90.

Mean temperature of the month 36°·27; difference in the mean lunar variation 10°·5. The hottest year was 1849, when the wind prevailed from west to north 15 days; and the coldest year was 1843, when the wind prevailed for 13 days from west to north, and 12 days from north to east and east to south. The mean temperature of this month corresponds with April, but the days are 4° colder, and the nights about 3° warmer.

The barometer ranges on a mean from 30·2686 to 28·8229 ins.,—difference 1·4457; but the full range extends to 2·032 ins. in ten years. Mean height for the month is 29·6873 ins.

The prevailing winds are westwardly; the average of ten years being north to east 3·9, east to south 4·6, south to west 10·3, west to north 11·2.

The mean rain for this month is 4·7456 ins., falling on an average on 4·7 nights and 11·2 days, or a total of 15·9 throughout the month. Snow falls generally on six days, averaging 9½ ins. in depth. The greatest storm was 16 ins. in one day in 1852, but it did not remain on the ground. It hailed once in 1850. On an average there are 20·8 nights of frost, giving 127°·5 of frost.

DECEMBER.—The length of the middle day is 8 hours 40 minutes. The average temperature rises to 29°·876, and falls to 18°·656, making a solar variation of 11°·22. Mean temperature for the month 24°·21; difference in the mean lunar variation 11°·8. The hottest year was 1847, when the wind prevailed from the south to west 12 days; and the coldest year was 1851, when the wind prevailed 13 days from west to north.

The barometer ranges on a mean from 30·3433 to 28·7499 ins., being a difference of 1·4457; but the full range extends to 2·081 ins. in ten years. The greatest depression, 28·410, occurred in this month in 1848. Mean height for the month is 29·6885 ins.

The prevailing winds are westwardly. The average for ten years is north to east 3·7, east to south 4, south to west 10·8, west to north 12·5.

The mean rain for this month is 4·8795 ins., falling on an average of 5·4 nights and 12·2 days, or a total of 17·6 throughout the month.

Snow falls generally on 13 days, averaging 2 ft. 2½ ins. The greatest storm was in 1846, when 18 ins. fell in 12 hours. It generally hails once or twice during this month. On an average there are 28 nights of frost, giving 428°·7 of frost.

Table of Meteorological Means for Ten Years, at the Albion Mines, Nova Scotia, North
120 feet above the sea.Ameri
6 feet

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.
Thermometer, mean of two extremes	18·84	19·52	26·98	36·90	48·44	58·29	65·94	65·85
Thermometer, at noon	25·466	28·075	36·135	46·240	59·287	69·990	77·800	76·340
Thermometer, at night	12·180	10·955	17·850	27·637	37·630	46·630	54·920	55·390
Barometer, at noon	29·6958	29·6866	29·6720	29·7022	29·7459	29·6739	29·7104	29·7699
Nights of rain or snow	5·1	4	4	4·3	4	4·5	5·1	4·9
Days of rain or snow	11	9	10	8·3	9·5	9·4	9·6	9·2
Quantity of rain or melted snow	3·3814	3·2673	4·3963	2·6500	2·8976	2·1539	30·210	4·4299
Days of snow	12·1	10·5	11·5	6·7	1·9	....	....	....
Quantity of snow in inches	20·86	18·54	24·90	9·33	1·25	....	....	....
Days of wind from N. to E.	3·8	4·2	5·5	7·7	7·6	7·5	5·9	6
Days of wind from E. to S.	4·4	4·9	5·5	3·5	6·4	5·4	5·2	6·4
Days of wind from S. to W.	7·4	6·9	7	7·4	7·9	9·4	14	10·6
Days of wind from W. to N.	15·4	12·3	13	11·4	9·1	7·7	5·9	8
Days clear, or without clouds	....	·4	·2	1·2	·4	....	....	....
Days cloudy	27	25·2	27	24·6	28·6	29	30·4	30·2
Days overcast, or without blue sky	4	2·8	3·8	4·2	2	1	·6	·8
Nights of frost	29·3	27·2	28·3	24·3	10·7	3·8	·5	·5
Nights below zero	6·7	7·7	2·8	·2	....	....	....	....
Degrees of frost below 32 degrees.	623	600·4	453	164·8	31·2	2·15	....	....
Lightning and thunder	·4	·1	·5	·3	1·3	3·7	6·1	3·8

Climate of the Albion Mines, Nova Scotia, North America, compared

with other

Station.		Latitude North.	Long.	Height of Station.	Mean Monthly								Temperature.	
Name of place.	American Continent.				Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.
Albion Mines ..	N. Scotia ..	45° 34' 30"	62° 43' W.	120	18·84	19·52	26·98	36·90	48·44	58·29	65·94	65·85	56·09	46·
Halifax	N. Scotia ..	44° 30'	63° 38' W.	..	30	16	25	30	40	50	63	70	81	51
Charlotte Town ..	P. E. Island	46° 12'	63° 0' W.	..	17·9	23·8	27·8	37·6	51·6	60·2	69·5	67·7	59·5	45
Fredericton	N. Brunswick	45° 57'	66° 45' W.	..	17	24	33	40	37	48·5	63·5	69·75	61·5	47
Montreal	Canada	45° 31'	73° 25' W.	..	15·01	19·22	30·98	45·82	60·49	69·25	73·57	71·37	61·15	48
Ft. McKinack ..	Lake Huron	45° 51'	85° 05' W.	728	20·13	15·76	26·09	37·66	46·25	56·32	63·19	63·50	53·55	43
European Continent.														
Vienne	France	45° 32' 0"	4° 53' E.	..	36·28	38·98	49·10	55·63	63·95	69·13	72·95	73·40	65·75	54
Triest	Germany ..	45° 38' 0"	13° 46' E.	..	38·26	39·45	44·67	52·93	63·28	69·04	72·61	72·82	65·23	57
Milan	Italy	45° 28' 0"	9° 11' E.	720	33·22	38·30	45·88	54·66	64·09	70·66	74·75	73·68	66·47	50
Venice	Italy	45° 26' 0"	12° 21' E.	20	35·29	38·98	46·15	54·73	63·36	70·39	75·07	73·72	66·27	50

North
the sea.America. Latitude 45° 34' 30" North; Longitude 62° 42' West from Greenwich.
6 feet from the ground.

July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.	Winter.	Spring.	Summer.	Autumn.
65.94	65.85	56.09	46.34	36.27	24.21	41.974	20.857	37.44	63.36	46.243
77.800	76.340	65.640	53.882	42.250	29.876	50.915	27.806	47.220	74.710	53.924
54.920	55.390	46.590	38.526	30.350	18.656	33.109	13.930	27.706	52.313	38.489
29.7104	29.7699	29.7671	29.7657	29.6873	29.6885	29.7137	29.6900	29.7067	29.7181	29.7400
5.1	4.9	3.8	5.8	4.7	5.4	56.2	14.5	12.3	14.5	14.3
9.6	9.2	8.6	9.7	11.2	12.2	117.4	32.2	27.8	28.2	29.5
30.210	4.4299	3.0048	5.7760	4.7456	4.8795	44.9676	11.5282	9.9439	9.6048	13.5264
....	....	2	1.5	6.1	12.9	63.4	35.5	20.1	....	7.8
....	....	....	6	10.29	25.69	111.46	65.09	35.48	....	10.89
5.9	6	5.4	5.3	3.9	3.7	66.5	11.7	20.8	19.4	14.6
5.2	6.4	4.9	5.7	4.6	4	60.9	13.3	15.4	17	15.2
14	10.6	10	10.2	10.3	10.8	111.9	25.1	22.3	34	30.5
5.9	8	9.7	9.8	11.2	12.5	126	40.2	33.5	21.6	30.7
....	....	16	34	....	16	2.86	56	1.80	....	50
30.4	30.2	28.5	27	26.5	26.5	330.50	78.70	80.20	89.60	82
6	8	1.34	3.66	3.5	4.34	32.04	11.14	10	2.40	8.50
5	5	5	10.4	20.8	28	188.8	84.5	63.3	4.8	36.2
....	....	....	....	....	2.3	19.7	16.7	3	....	....
....	....	3.9	35.3	127.5	428.7	2470	1652.1	649	2.15	166.7
6.1	3.8	1.2	1	2	5	19.1	1	2.1	13.6	2.4

compared with other places of, or near the same degree of North Latitude.

Mean Monthly		Temperature.				Mean of Year.	Seasons.				Extremes.		Years of Observation.	Hours of Observation.	Authority.
July.	Aug.	Sept.	Oct.	Nov.	Dec.		Winter.	Spring.	Summer.	Autumn.	Summer and Winter.	Hot and Cold.			
65.94	65.83	56.09	46.34	36.27	24.21	41.94	20.86	37.44	63.36	46.24	42.50	47.10	10	Sunrise and 2 p.m., or extremes.	H. Poole.
63	70	51	51	38	25	40.08	21	31.67	61	46.67	46	52	2	N. Y.	Dove.
69.5	67.7	59.5	45.8	37.5	28.6	43.9	23.3	39	65.8	47.6	42.5	51.6	1	.....	Boston Daily Advertiser.
63.5	69.75	61.5	47.5	31	13.5	40.69	18.17	36.67	61.25	46.67	43.08	52.75	..	.....	Montgomery
73.57	71.37	61.15	48.66	34.43	19.13	45.57	17.79	45.76	71.40	48.08	53.61	58.56	10	7 a.m. & 3 p.m.	Dove.
63.19	63.50	53.55	43.40	33.20	23.15	40.37	20.08	36.69	61.33	43.39	41.25	47.74	7	Sunrise, 2 p.m., 9 p.m.	U. S. Army.
72.95	73.40	65.75	54.95	43.25	41	55.36	38.76	56.23	71.83	54.63	33.08	37.12	6	.....	Cotte.
72.61	73.52	65.23	57.22	47.62	40.60	55.30	39.44	55.69	71.39	56.69	31.95	34.35	15	7 a.m., 2 p.m., 9 p.m.	Schouw.
74.75	73.58	66.47	56.95	47.08	36.57	55.19	36.03	54.88	73	56.83	36.97	41.53	59	Sunrise, and 2 to 3 p.m.	Dove.
75.07	73.72	66.27	56.66	44.65	39.92	55.44	38.06	54.76	73.06	55.86	35	39.78	7	Sunrise, 2 1/2 p.m., 9 p.m.	Schouw.

Albion Mines, Nova Scotia.

Daily Mean Temperature for 11 years.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	6 feet above ground in shade, N.E.
1	22°55	13°22	21°59	33°51	41°36	49°00	60°41	69°73	60°00	50°00	42°13	27°45	Monthly Mean. 19°55 19°00 27°41 37°378 48°58 58°142 66°10 65°19 56°063 46°282 35°588 24°47
2	18°00	10°13	21°27	30°50	45°00	52°32	60°59	69°18	60°77	47°77	44°08	33°13	
3	22°53	21°54	20°51	32°55	43°36	55°41	60°58	67°86	63°09	49°53	44°22	27°22	
4	20°59	22°33	19°36	34°08	43°54	56°59	62°18	67°41	64°18	48°23	43°54	30°50	
5	20°04	24°51	21°09	35°73	43°45	56°09	64°77	67°73	61°59	49°41	40°27	32°56	
6	20°56	24°04	20°54	34°04	45°59	55°77	65°13	65°86	59°91	49°63	40°50	26°32	
7	20°72	24°04	22°32	30°45	47°27	54°27	63°55	65°23	63°45	47°13	37°09	26°27	
8	24°45	21°45	25°22	32°27	49°59	56°32	64°18	66°04	61°86	47°82	36°91	27°59	
9	19°59	19°22	20°91	28°73	48°95	56°00	65°89	67°41	57°84	44°36	35°82	26°22	
10	24°04	20°54	25°22	35°03	46°95	56°91	66°41	68°73	55°45	48°09	37°14	28°56	
11	20°77	21°31	24°32	35°82	47°06	56°41	68°91	68°00	57°54	47°91	25°54	25°41	
12	18°54	21°59	24°00	34°04	47°59	52°95	67°50	67°54	57°18	47°26	33°50	25°18	
13	19°77	15°13	26°41	35°45	43°50	53°04	67°16	64°77	56°31	51°00	34°90	24°00	
14	23°53	16°27	20°27	37°09	49°05	56°13	66°27	67°09	54°76	48°86	32°36	20°68	
15	20°77	19°54	25°17	37°63	50°23	57°82	66°41	66°41	54°50	45°50	32°54	24°95	
16	20°77	18°72	23°27	36°54	53°09	57°18	66°72	62°00	54°18	48°59	32°90	25°73	
17	18°95	19°67	27°32	36°68	53°41	56°86	67°95	64°82	53°00	44°22	34°18	26°45	42°0786
18	18°50	18°63	26°63	34°86	49°46	59°77	69°72	64°04	53°27	46°59	36°32	25°95	
19	12°91	16°18	28°91	37°36	46°41	63°73	66°82	64°22	56°00	49°63	36°45	21°23	
20	11°04	17°22	28°45	38°63	51°00	64°04	69°13	62°04	55°00	46°86	35°90	23°50	
21	16°95	19°50	32°54	41°56	49°04	62°41	70°08	61°36	59°41	43°54	35°73	21°00	
22	14°68	19°95	30°45	41°12	49°39	62°41	72°82	62°77	54°86	44°64	35°09	13°68	
23	14°68	23°09	28°18	40°59	54°32	63°04	71°77	63°91	52°35	48°19	34°82	19°41	
24	19°04	22°41	31°73	40°04	51°28	61°41	67°39	62°35	53°45	44°96	35°63	22°59	
25	24°27	20°41	30°50	38°54	51°27	62°41	65°45	63°86	50°18	44°95	32°73	21°11	
26	24°68	21°45	32°09	39°91	51°45	59°77	65°45	62°59	49°04	43°59	34°68	21°66	
27	16°50	21°68	35°09	40°63	51°18	60°50	64°63	62°82	51°09	43°50	29°45	18°33	
28	12°50	16°72	33°68	41°00	49°04	61°18	64°68	63°41	49°41	42°04	29°32	10°50	
29	18°54	20°50	34°81	42°00	51°36	61°41	64°23	63°50	51°32	39°59	25°90	16°32	
30	21°86	....	35°04	40°95	51°41	63°13	64°91	64°41	51°68	44°32	28°04	23°95	
31	13°25	....	34°64	....	49°59	....	67°32	63°86	....	41°86	....	24°41	
	19°85	19°90	27°41	37°378	48°58	58°142	66°10	65°19	56°053	46°282	35°588	24°47	

